

TS-960e-5G



MMWAVE / 5G PXIE PRODUCTION TEST SYSTEM

- mmWave Device Production Test and Characterization
- DC, Parametric and RF Test Capabilities
- PXIe based, Compact, Scalable Platform
- Supports Up to 20 RF Ports
- 50 GHz Signal Delivery to the Device Under Test
- Comprehensive ICEasy Semiconductor Test Suite
- Intuitive ATEasy® - Integrated Test Executive / Development Environment



DESCRIPTION

The 5G mmWave test system delivers proven performance up to 50 GHz. The system incorporates laboratory grade PXIe RF instrumentation with a high performance receiver interface for packaged or wafer test / characterization of mmWave devices. In addition, MTS offers a full suite of digital and parametric test capabilities as well as SPI/I2C interface support for controlling / monitoring the device under test (DUT).

The base system includes a PXIe chassis with 64 dynamic digital I/O channels, 64 static digital I/O channels, a user programmable power supply, a system self-test and fixture. Additional PXIe slots are available for adding RF instrumentation, more digital and analog test resources as needed.

System software includes DIOEasy for digital waveform editing / display, [ICEasy](#) for device test development, and Marvin Test Solutions' [ATEasy](#) which provides an integrated and complete test executive and test development environment, allowing users to quickly develop and easily maintain test applications.

Offering a total of 20 PXI / PXIe peripheral slots, additional digital and analog test resources can be added to the TS-960e-5G as test needs evolve. The TS-960e-5G is the ideal test solution for semiconductor OEMs, fabless semiconductor vendors, incoming inspection / counterfeit detection labs and packaging / test vendors needing a cost-effective, configurable mmWave test system.

For production test applications requiring integration with an automated handler, the TS-960e-5G is available with the Reid-Ashman OM-1069 manipulator which provides precise positioning of the test head and the flexibility to interface to probers and device handlers.

The TS-960e-5G's device interface board (DIB) / receiver interface is designed to be compatible with virtually any device handler. The TS-960e-5G utilizes the same receiver interface as the TS-960EX-5G, providing DIB compatibility between the two systems. The receiver interface is also compatible with the Opus 3 and TEL probe stations as well as the Seiko Epson E8040 & E8080 device handlers.

FEATURES

The TS-960e-5G can be configured with up to 256 dynamic digital channels. The base platform uses the [GX5296](#) - a 3U PXI, 32 channel, 100 MHz digital I/O card with per channel parametric measurement units (PMUs).

A wide range of digital and analog instrument options can easily be incorporated into the TS-960e-5G for supporting both functional and DC parametric test capabilities. RF instrumentation options include the Keysight M9807 / M9808 PXIe VNAs.

The system is also available with digital vector conversion tools that support ASCII, WGL, STIL, VCD, eVCD and ATP vector formats.

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TS-960E-5G CORE SYSTEM CONFIGURATION

The TS-960e-5G core system includes the following test resources and capabilities:

- ICEasy test software development tools
- ATEasy test executive and programming environment
- [GX3104](#) SMU with 4 channels each (expandable to 16)
- DIOEasy digital waveform editing and display tools
- Embedded i7, quad core controller with Windows®10 OS
- (64) 100 MHz digital channels with per pin PMU (expandable to 256)
- (64) static digital channels (expandable to 128), which can be used for fixture ID, UUT static control or DUT board relay control
- 21-slot, high-power PXI Express chassis
- Pogo pin, blind-mate receiver interface with 24, 50 GHz RF ports

SOFTWARE

The test system is supplied with ATEasy and all instrument drivers, virtual instrument panels, and a system self-test. optional in system calibration, as well as ICEasy test software tools which facilitates device test development and characterization such as I-V curve and Shmoo plot tools for analyzing device DC and AC characteristics..

SemiEasy - a production user interface is also provided supporting interface to Handlers, Binning, STDF file generation, Multi-Sockets/DUTs Parallel testing, and more.

[ATEasy®](#) Test Executive and Software Development Studio is a comprehensive software development environment featuring a customizable test executive for execution, sequencing, fault analysis and debugging. It is pre-configured with all required instrument drivers, virtual instrument panels, and system selftest to simply startup and software development activities.

APPLICATIONS

- mmWave packaged and wafer device test / characterization
- Pilot production and focused production test
- Automated failure analysis and test

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SPECIFICATIONS

MMWAVE TESTS	
Tx / Rx Tests	S-Parameter Measurement (Insertion / Return Loss) S12, S21, S11, S22
TS-960E-5G PXIE CHASSIS	
Number of Slots	1 controller, 8 PXI-1, 8 Hybrid, 4 PXIe
System CPU (Embedded)	Intel Core i7, 2.4 GHz, single slot controller 4x4 PCIe bus configuration 8 GB of RAM
System Hard Disk	320 GB (min)
Cooling	(4) 100 CFM fans for system cooling. Integrated temperature monitoring via an on-board microcontroller with audible and software notification when preset temperature limits are exceeded. Fan speed control and monitoring is automatic and can be controlled / monitored via the GxChassis software.
PXI Clock	Integrated 10 MHz PXI clock with auto-detect function. Presence of an external 10 MHz PXI clock will disable the internal clock. PXI clock is distributed to all peripheral slots. Optional external clock via slot 2
Temperature Monitoring	Per slot monitoring, 1 reading/sec/slot 4 second moving average value User selectable alarm criteria: <ul style="list-style-type: none"> • Maximum slot temperature • Average slot temperature Accuracy: $\pm 2^\circ\text{C}$ Default warning and shutdown limits: $+50^\circ\text{C}$ & $+70^\circ\text{C}$ Warning and shutdown limits programmable via software driver Status: Query via software driver and audible alarm for a warning limit condition
Power Supply Monitoring	Monitored voltages: 3.3, 5, +12, -12, VIO value Accuracy: $\pm 2\%$ of reading
PXI Triggers	Slots: 2 – 21 Number: 8 per segment Software controlled segment mapping supports: <ul style="list-style-type: none"> • Isolate a trigger line within a segment • Map a trigger line left to right • Map a trigger line right to left
PXI Clock and Synch Resources	Integrated 10 and 100 MHz clock with an auto-detect function. Presence of an external 10 MHz PXI clock will synchronize the 100 MHz clock to the external 10 MHz source 100 MHz clock accuracy: ± 30 ppm Synchronization signals: SYNC100 & SYNC_CTRL

External 10 MHz Clock Input	An external 10 MHz clock source (TTL level) can be provided via a rear panel BNC or via a PXI Express System Timing Controller
10 MHz Clock Output	10 MHz output is available via a rear panel BNC connector, TTL compatible level
PXIe System Power	1600 W
PXIe Chassis Input AC Power	120 VAC, $\pm 15\%$; 20 A max (PFC) 240 VAC, $\pm 10\%$; 10 A max (PFC) 47 Hz to 440 Hz
DYNAMIC DIGITAL I/O SUBSYSTEM	
Number of Digital I/O and PMU Channels	64 (base configuration)
Maximum Channel Configuration	256 channels
Maximum Clock Rate	100 MHz
Digital Test Modes	Stimulus / response Real-time compare
Vector Memory	64 Mb / channel
Real Time Compare Record Memory	1,024 (records data and program steps)
Drive Voltage Range	-2 V to +7 V, Drive Hi & Drive Lo, maximum swing is 8 V
Sense Voltage Range	-2 V to +7 V, Sense Hi & Sense Lo
Programmable Pull-Up / Pull-Down Current Source / Sink	± 24 mA, programmable on a per channel basis, V commutate range: -2 V to +7 V, programmable on a per channel basis
High and Low Commutation Voltage Range	VCLo: -2 V to +5 V VCHi: 0 V to +7 V
Voltage Clamp Accuracy	± 100 mV

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Parametric Measurement (PMU)	
Number of Parametric Measurement Units	32, one per channel 4, one per auxiliary channel (for timing /control & static I/O functions)
Configurations	Force Voltage/Measure Current (FVMI) Force Current/Measure Voltage (FIMV) Force Voltage/Measure Voltage (FVMV) Force Current/Measure Current (FIMI)
Force Voltage Range	-1.5 V to +7 V
Force Voltage Accuracy	±20 mV
Force Voltage Resolution	16 bits
Force Current Ranges	±32 mA, ±8 mA, ±2 mA, ±512 uA, ±128 uA, ±32 uA, ±8 uA, ±2 uA FS
Force Current Accuracy: Compliance Range: +1.75 V to +7 V @ 32 mA -1.5 V to +7 V @ no load	±120 uA, 32 mA range ±40 uA, 8 mA range ±5 uA, 2 mA range ±1.2 uA, 512 uA range ±600 nA, 128 uA range ±160 nA, 32 uA range ±80 nA, 8 uA range ±20 nA, 2 uA range
Current Measurement Accuracy (60 Measurements / Sec) Compliance Range: +1.75 V to +7 V @ 32 mA -1.5 V to +7 V @ no load	±120 uA, 32 mA range ±40 uA, 8 mA range ±5 uA, 2 mA range ±1.2 uA, 512 uA range ±600 nA, 128 uA range ±160 nA, 32 uA range ±80 nA, 8 uA range ±20 nA, 2 uA range
Measure Voltage Range	-2 V to +7 V
Measure Voltage Accuracy	±1 mV (measurement rate < 200 measurements / sec)
STATIC DIGITAL INSTRUMENT	
Number of Static Digital I/O Channels	64, expandable to 128 48 Input / Output (programmable I/O in groups of eight) 16 inputs for fixture ID
Logic Levels	LVTTL compatible
Source / Sink Current	24 mA (max)

USER POWER	
Source / Measure Unit (SMU)	4-channel, 4 quadrant operation, isolated outputs, common ground, with remote sense
Programmable Voltage Range	0 to ±20 V
Output Voltage Accuracy	±0.05% of programmed value + 2 mV
Output Noise	<20 mV p-p, 20 MHz BW, full load
Output Current	±2.5 uA to ±250 mA in decade ranges, any one channel can supply up to 1A
Output Current Accuracy	±0.05% of programmed value + 0.05% of FS
Voltage Measurement Accuracy	±0.03% of programmed value + 2 mV
Current Measurement Accuracy	Ranges: 2.5 uA to 250 mA in decades Accuracy: ±0.05% of reading + 0.05% of FS range
Measurement Resolution	Programmable, 18 to 24 bits
RF VECTOR NETWORK ANALYZER OPTIONS	
Keysight Technologies	M9807, 2 port VNA, 40 GHz, PXIe M9808A, 2 port VNA, 53 GHz, PXIe
TS-960E-5G RECEIVER INTERFACE	
Type	Modular, pogo-pin and blind-mate RF interface
Interfaces	<ul style="list-style-type: none"> • (4) 128 pin digital blocks • (2) power blocks (8 DPS) • 24 blind mate RF ports (Weinschel Planar Blind-Mate, 2.92mm (SMK)

MANUFACTURING



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ENVIRONMENTAL / PHYSICAL	
Operating Temperature	0 °C to +50 °C
Storage Temperature	-20 °C to +60 °C
Relative Humidity (Non-Condensing)	90%
Altitude	30,000 ft
Weight	125 lbs, core system
Overall Size	24" D x 22" W x 17" H
Manipulator Option	Reid-Ashman OM-1069

Note: Specifications are subject to change without notice

ORDERING INFORMATION

TS-960e-5G	mmWave / 5G PXIe Semiconductor Test System, 64 Dynamic Digital I/O Channels with per Pin PMU
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